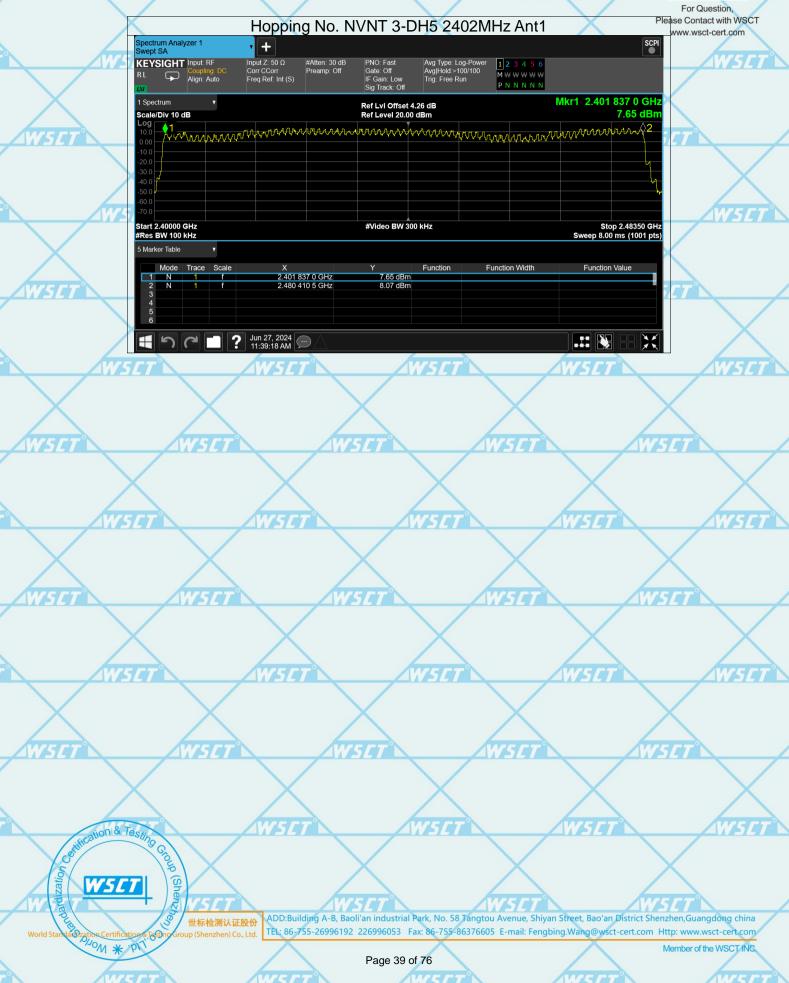


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6.7. Dwell Time

6.7.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2014 W5CT
Limit:	The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.
Test Setup:	Spectrum Analyzer EUT
Test Mode:	Hopping mode W5C7 W5C7
Test Procedure:	 The testing follows ANSI C63.10:2014 Measurement Guidelines. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement. Set to the maximum power setting and enable the EUT transmit continuously. Enable the EUT hopping function. Use the following spectrum analyzer settings: Span = zero span, centered on a hopping channel; RBW shall be ≤ channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel; VBW≥RBW; Sweep = as necessary to capture the entire dwell time per hopping channel; Detector function = peak; Trace = max hold. Measure and record the results in the test report.
Test Result:	PASS

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6.7.2. Test Data

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Mode	Frequency	Pulse Time	Total Dwell Time	Burst	Period Time	Limit	Verdict
	(MHz)	(ms)	(ms)	Count	(ms)	(ms)	
1-DH1	2402	0.378	118.314	313	31600	400	Pass
1-DH1	2441	0.378	119.448	316	31600	400	Pass
1-DH1	2480	0.376	117.688	313	31600	400	Pass
1-DH3	2402	1.634	235.296	144	31600	400 🦯	Pass
1-DH3	2441	1.634	271.244	166	31600	400	Pass
1-DH3	2480	1.633	280.876	172	31600	400	Pass
1-DH5	2402	2.882	273.79	95	31600	400	Pass
1-DH5	2441	2.88	299.52	104	31600	400	Pass
1-DH5	2480	2.88	302.4	105	31600 🧹	400	Pass
Arrest	0		have				

Note: 1. In normal mode, hopping rate is 1600 hops/s with 6 slots in 79 hopping channels.

For DH1, With channel hopping rate (1600 / 2 / 79) in Occupancy Time Limit (0.4×79) (s), Hops Over Occupancy Time comes to $(1600 / 2 / 79) \times (0.4 \times 79) = 320$ hops

For DH3, With channel hopping rate (1600 / 4 / 79) in Occupancy Time Limit (0.4×79) (s), Hops Over Occupancy Time comes to $(1600 / 4 / 79) \times (0.4 \times 79) = 160$ hops

For DH5, With channel hopping rate (1600 / 6 / 79) in Occupancy Time Limit (0.4 x 79) (s), Hops Over Occupancy Time comes to (1600 / 6 / 79) x (0.4 x 79) = 106.67 hops

2. Dwell Time(s) = Hops Over Occupancy Time (hops) x Package Transfer Time

Test plots as follows:

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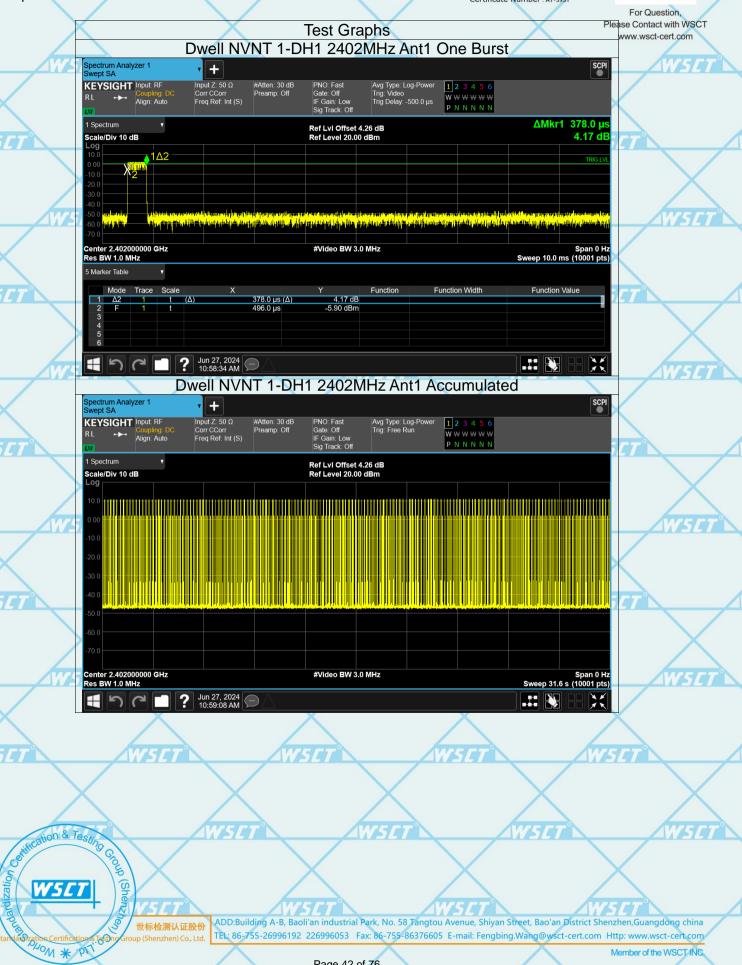


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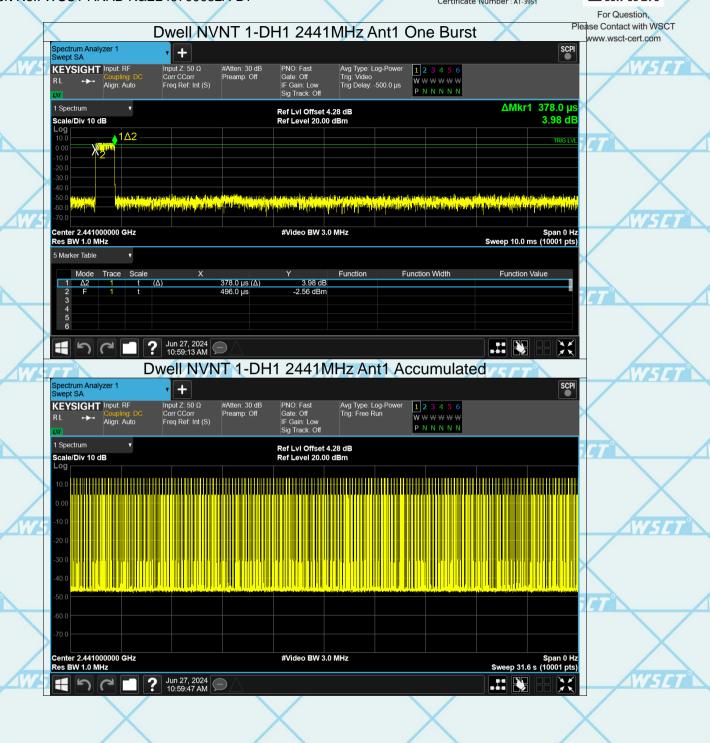
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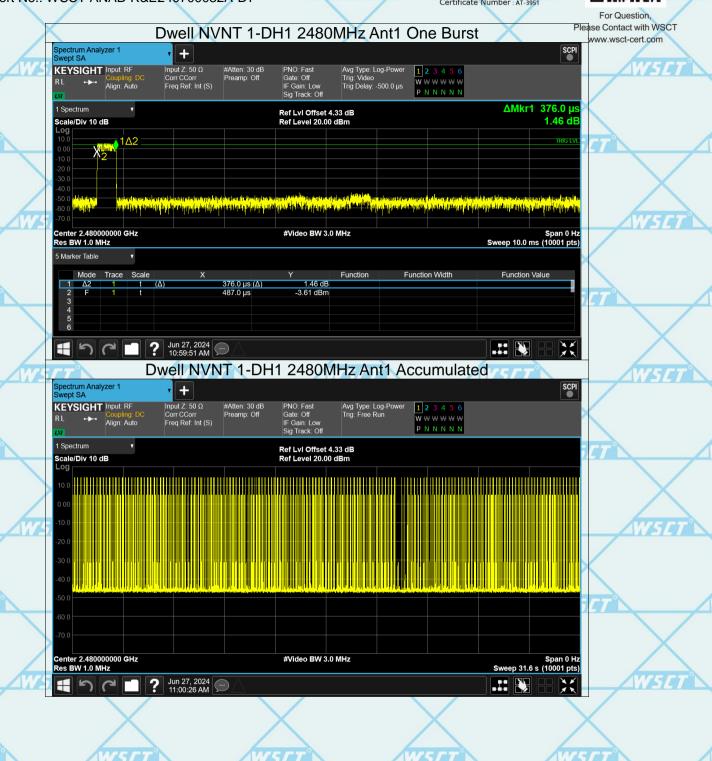
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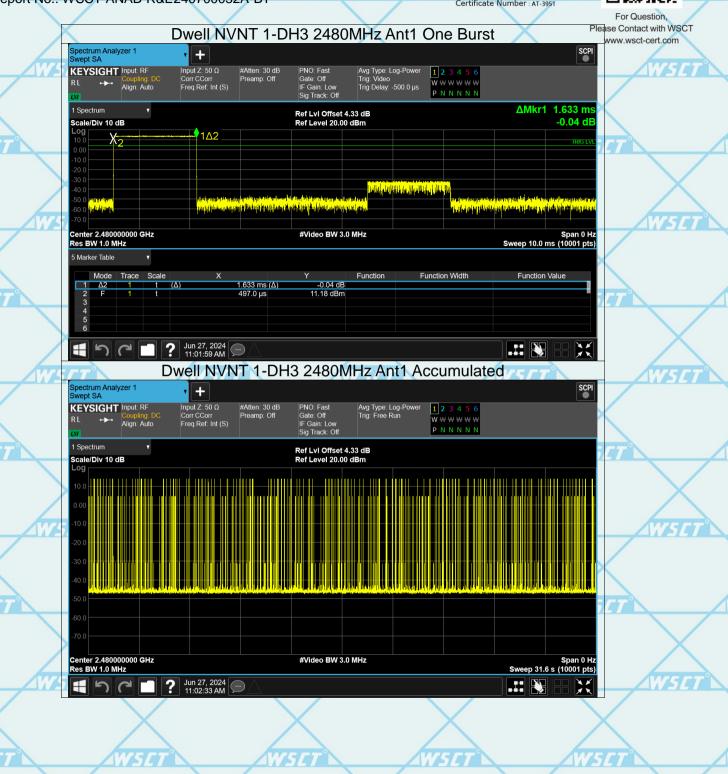
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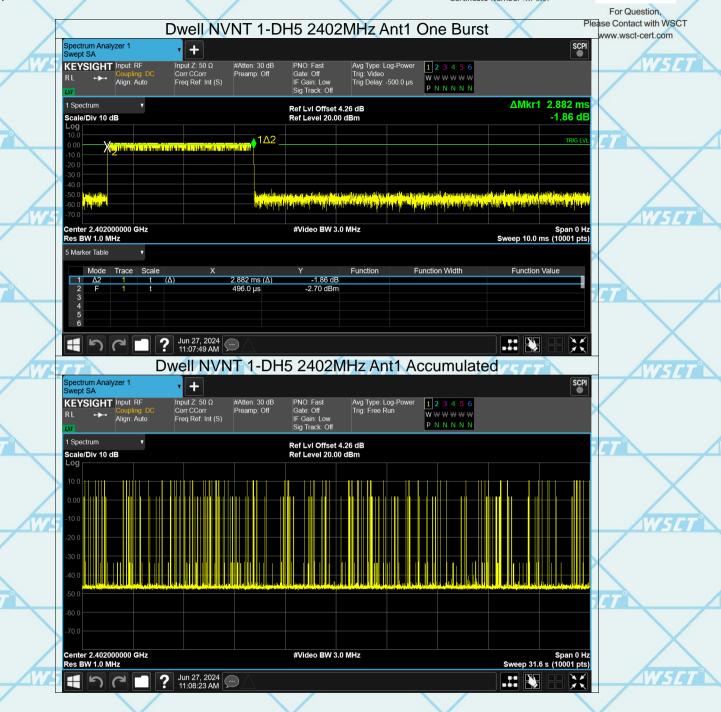
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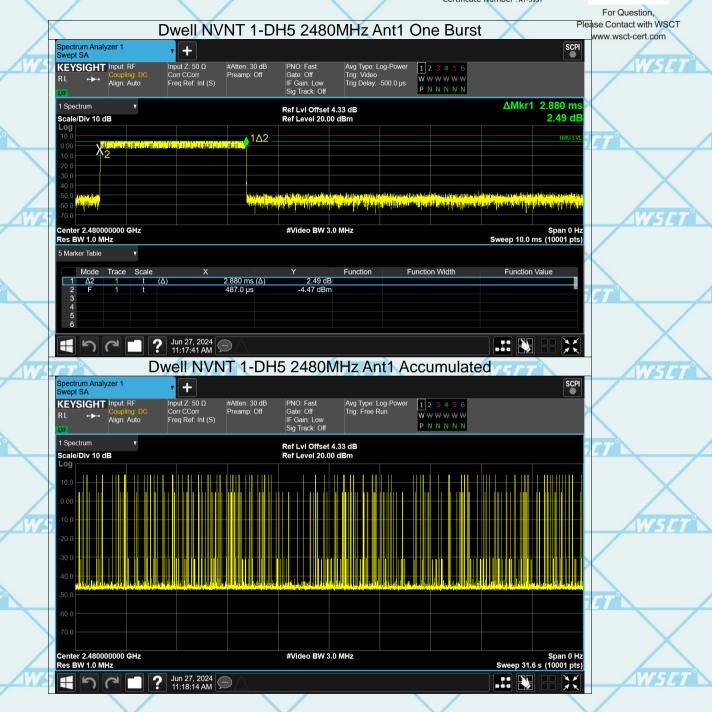
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6.8. **Pseudorandom Frequency Hopping Sequence**

For Question, Please Contact with WSCT www.wsct-cert.com

Test Requirement: FCC Part15 C Section 15.247 (a)(1) requirement:

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Alternatively. Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

EUT Pseudorandom Frequency Hopping Sequence

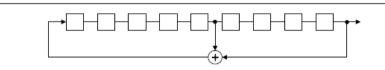
The pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first one of 9 consecutive ones; i.e. the shift register is initialized with nine ones. • Number of shift register stages: 9

• Length of pseudo-random sequence: $2^9 - 1 = 511$ bits

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Longest sequence of zeros: 8 (non-inverted signal)



Linear Feedback Shift Register for Generation of the PRBS sequence

An example of Pseudorandom Frequency Hopping Sequence as follow:

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/														
		_			L	4						 		1
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Each frequency used equally on the average by each transmitter. The system receivers have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals.

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6.9. Conducted Band Edge Measurement

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	Test Requirement:	FCC Part15 C Section 15.247 (d)	
	Test Method:	ANSI C63.10:2014	
7	Limit:	In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.	wsi
71	Test Setup:	Spectrum Analyzer	
	Test Mode:	Transmitting mode with modulation	\square
7	Test Procedure:	 The testing follows the guidelines in Band-edge Compliance of RF Conducted Emissions of ANSI C63.10:2014 Measurement Guidelines. Set to the maximum power setting and enable the EUT transmit continuously. Set RBW = 100 kHz (≥1% span=10MHz), VBW = 300 kHz (≥RBW). Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100kHz RBW. The attenuation shall be 30 dB instead of 20 dB when RMS conducted output power procedure is used. Enable hopping function of the EUT and then repeat step 2 and 3. Measure and record the results in the test report. 	
	Test Result:	PASS	\square
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6.10. Conducted Spurious Emission Measurement

6.10.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2014
Limit:	In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.
Test Setup:	Spectrum Analyzer EUT
Test Mode:	Transmitting mode with modulation
Test Procedure:	 The testing follows the guidelines in Spurious RF Conducted Emissions of ANSI C63.10:2014 Measurement Guidelines The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement. Set to the maximum power setting and enable the EUT transmit continuously. Set RBW = 100 kHz, VBW = 300kHz, scan up through 10th harmonic. All harmonics / spurs must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW. Measure and record the results in the test report. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
Test Result:	PASS
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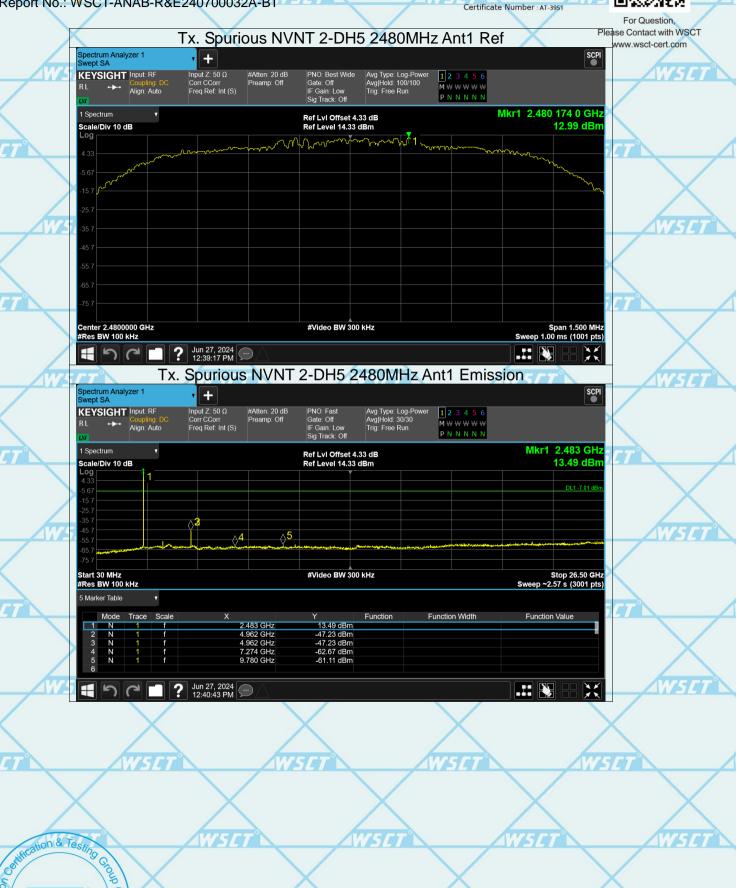
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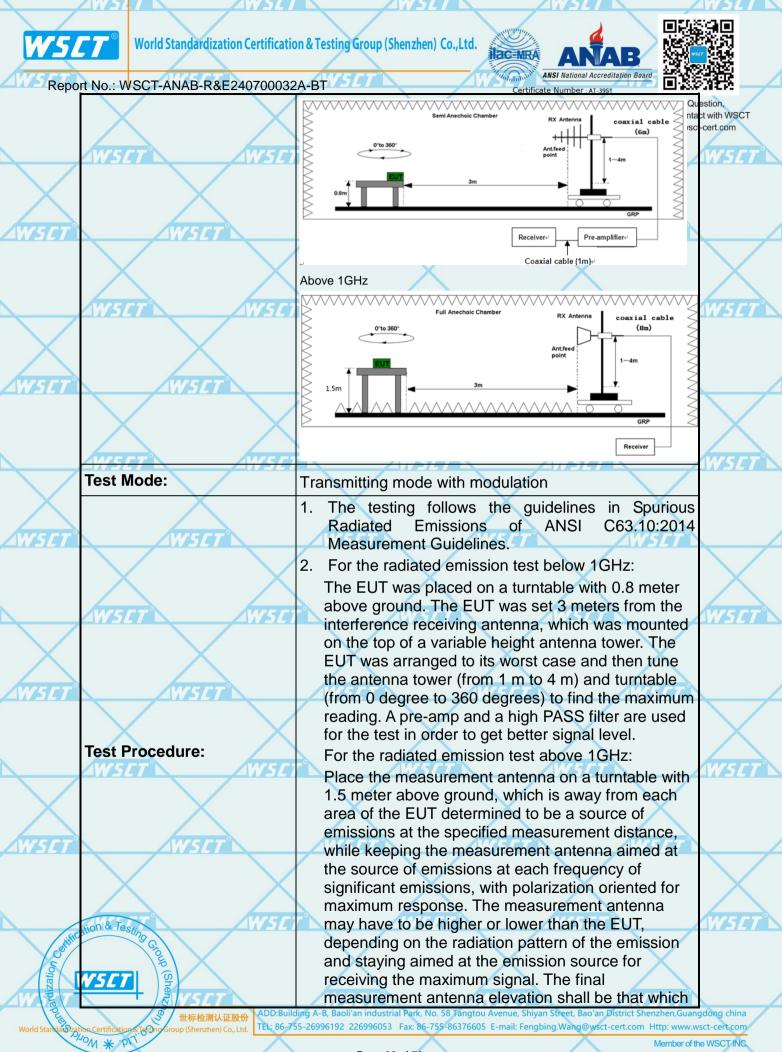
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6.11. Radiated Spurious Emission Measurement

For Question, Please Contact with WSCT www.wsct-cert.com

6.11.1. Test Specification **Test Requirement:** FCC Part15 C Section 15.209 Test Method: ANSI C63.10:2014 Frequency Range: 9 kHz to 25 GHz Measurement Distance: 3 m Antenna Polarization: Horizontal & Vertical RBW VBW Frequency Detector Remark <u>9kHz- 150kHz</u> Quasi-peak 200Hz 1kHz Quasi-peak Value 150kHz-Quasi-peak 9kHz 30kHz Quasi-peak Value **Receiver Setup:** 30MHz 30MHz-1GHz Quasi-peak 100KHz 300KHz Quasi-peak Value Peak 1MHz 3MHz Peak Value Above 1GHz Peak 1MHz 10Hz Average Value Field Strength Measurement Frequency (microvolts/meter) Distance (meters) 0.009-0.490 2400/F(KHz) 300 0.490-1.705 24000/F(KHz) 30 1.705-30 30 30 30-88 100 3 88-216 150 3 Limit: 216-960 200 3 Above 960 500 3 Measurement **Field Strength** Frequency Distance Detector (microvolts/meter) (meters) 500 3 Average Above 1GHz 5000 3 Peak For radiated emissions below 30MHz Distance = 3m Computer Pre -Amplifier Test setup: EUT Turn table Receiver Ground Plane 30MHz to 1GHz 5 WSC1 ADD:Building A-B, Baoli'an industrial Park, No. 58 Tangtou Avenue, Shiyan Street, Bao'an District Shenzhen, Guangdong china 世标检测认证股份 TEL: 86-755-26996192 226996053 Fax: 86-755-86376605 E-mail: Fengbing.Wang@wsct-cert.com Http: www.wsct-cert.com

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Report No.: WSCT-ANAB-R&E240700032A-BT maximizes the emissions. The measurement t with WSCT antenna elevation for maximum emissions shall be cert.com restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane. Set to the maximum power setting and enable the 3. EUT transmit continuously. Use the following spectrum analyzer settings: 4. (1) Span shall wide enough to fully capture the emission being measured; (2) Set RBW=100 kHz for f < 1 GHz, RBW=1MHz for f>1GHz; VBW≥RBW; Sweep = auto; Detector function = peak; Trace = max hold for peak (3) For average measurement: use duty cycle correction factor method per 15.35(c). Duty cycle = On time/100 milliseconds On time =N1*L1+N2*L2+...+Nn-1*LNn-1+Nn*Ln Where N1 is number of type 1 pulses, L1 is length of type 1 pulses, etc. Average Emission Level = Peak Emission Level + 20*log(Duty cycle) Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level Test results: PASS The symbol of "--" in the table which means not application. Note 1:

Note 2: For the test data above 1 GHz, According the ANSI C63.10-2013, where limits are specified for both average and peak (or quasi-peak) detector functions, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.
 Note 3: The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

Note 4: 5 The EUT is working in the Normal link mode below 1 GHz. All modes have been tested and normal link mode

is worst.

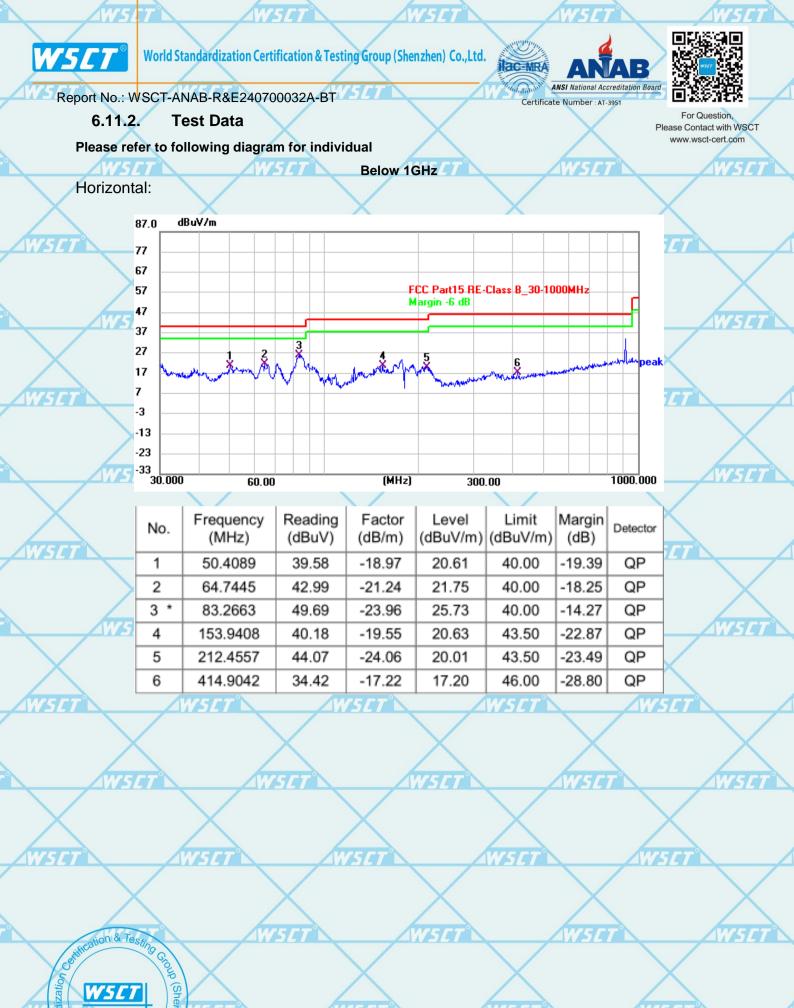
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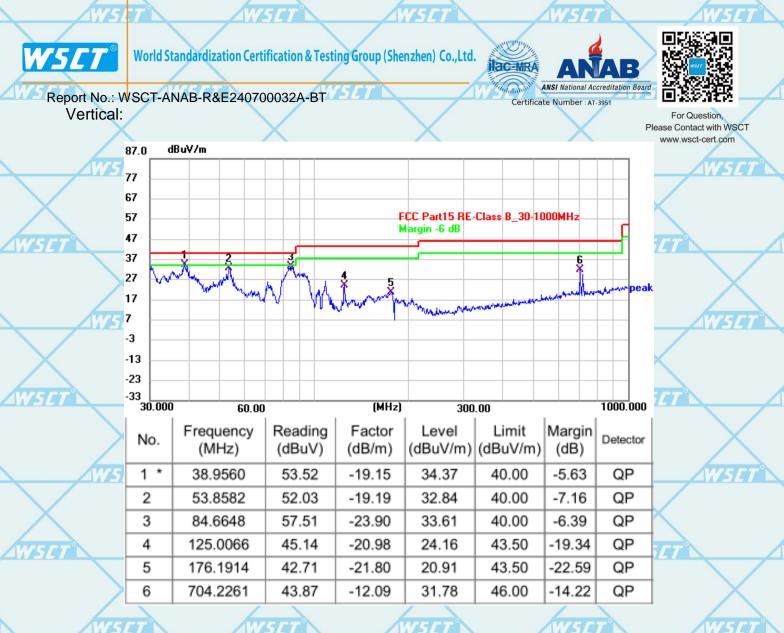
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Freq. = Emission frequency in MHz

Reading level (dBµV) = Receiver reading

Corr. Factor (dB) = Antenna factor + Cable loss - Amplifier factor.

Measurement $(dB\mu V)$ = Reading level $(dB\mu V)$ + Corr. Factor (dB)

Limit $(dB\mu V) = Limit$ stated in standard

Margin (dB) = Measurement (dB μ V) – Limits (dB μ V)

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Above 1GHz

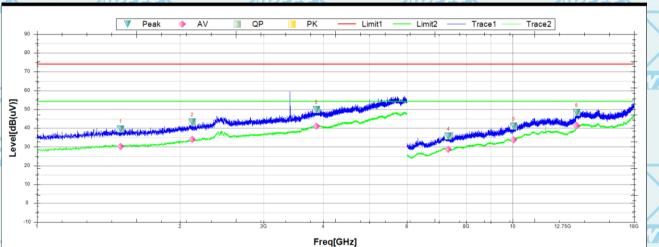
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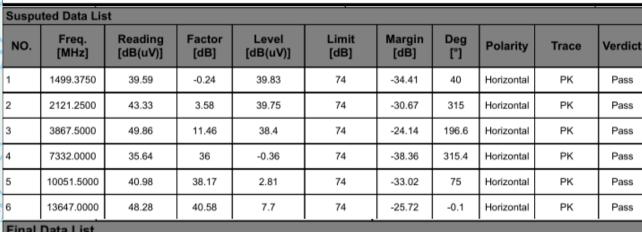
Note 1: The marked spikes near 2400 MHz with circle should be ignored because they are Fundamental signal.

Note 2: The spurious above 18G is noise only, do not show on the report. **GFSK** Low channel: 2402MHz

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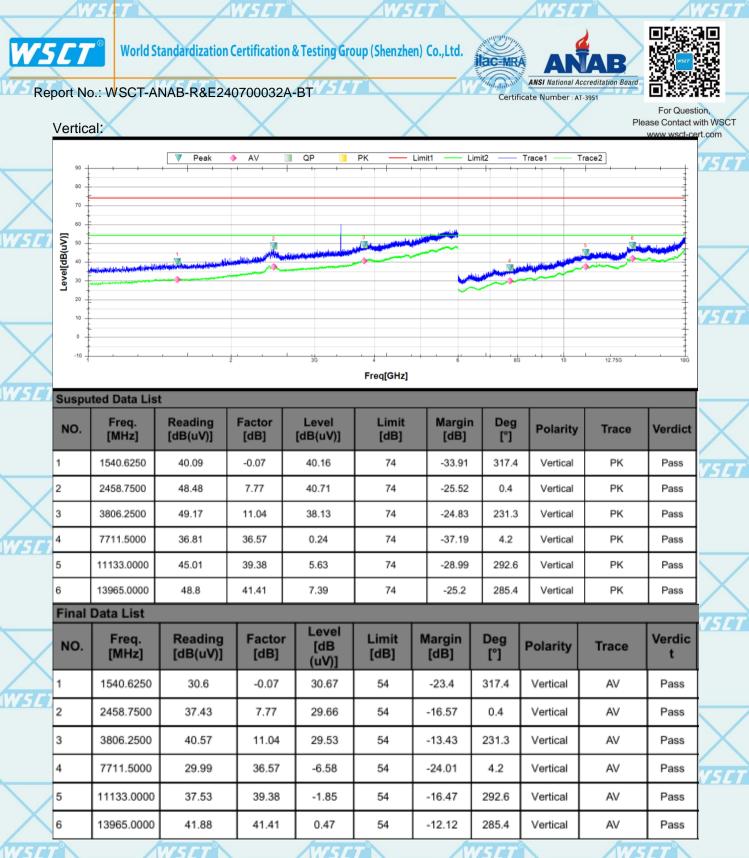




Final	Data List									
NO.	Freq. [MHz]	Reading [dB(uV)]	Factor [dB]	Level [dB (uV)]	Limit [dB]	Margin [dB]	Deg [°]	Polarity	Trace	Verdic t
1	1499.3750	30.27	-0.24	30.51	54	-23.73	40	Horizontal	AV	Pass
2	2121.2500	33.91	3.58	30.33	54	-20.09	315	Horizontal	AV	Pass
3	3867.5000	41.05	11.46	29.59	54	-12.95	196.6	Horizontal	AV	Pass
4	7332.0000	28.63	36	-7.37	54	-25.37	315.4	Horizontal	AV	Pass
5	10051.5000	33.84	38.17	-4.33	54	-20.16	75	Horizontal	AV	Pass
6	13647.0000	41.21	40.58	0.63	54	-12.79	-0.1	Horizontal	AV	Pass
.8100								12		

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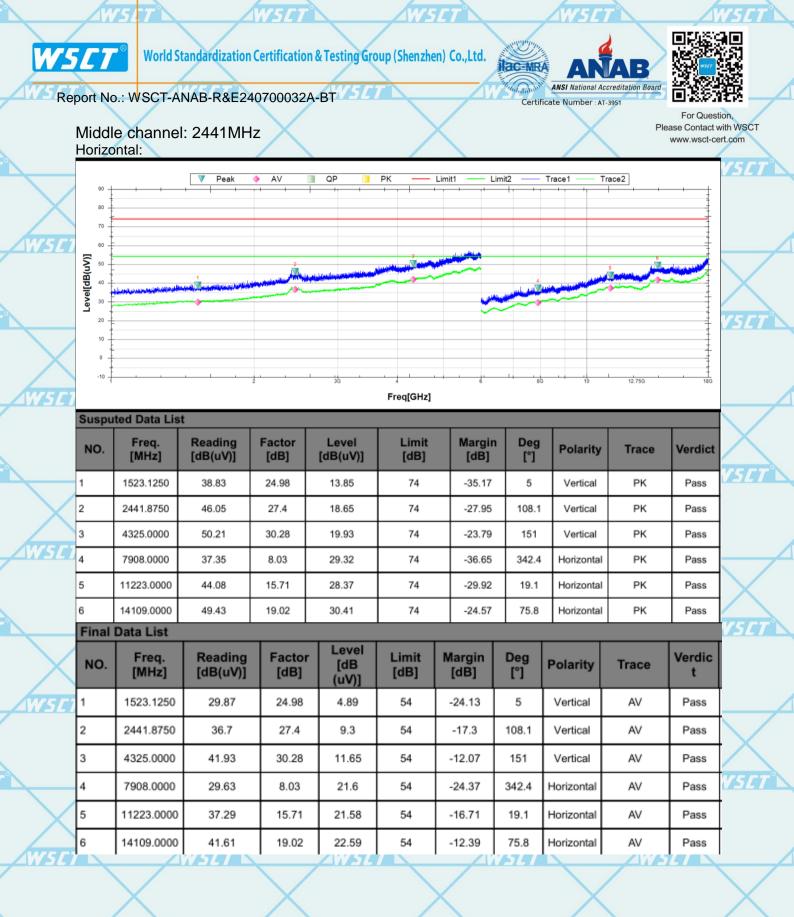
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Vertical:

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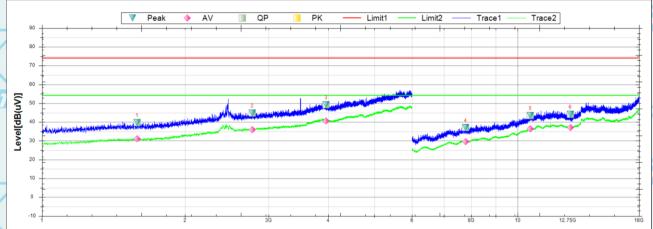
W5CT[°]

Report No.: WSCT-ANAB-R&E240700032A-BT

ilac MR/ ANSI National Accreditation Board Certificate Number : AT-3951

For Question. Please Contact with WSCT t-cert.com

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Freq[GHz]

	Suspu	ted Data Lis	st									
	NO.	Freq. [MHz]	Reading [dB(uV)]	Factor [dB]	Level [dB(uV)]	Limit [dB]	Margin [dB]	Deg [°]	Polarity	Trace	Verdict	
	1	1584.3750	39.64	24.92	14.72	74	-34.36	101.4	Vertical	PK	Pass	
/	2	2769.3750	44.74	27.92	16.82	74	-29.26	267.4	Vertical	PK	Pass	
X	3	3960.0000	49.28	29.6	19.68	74	-24.72	188.6	Vertical	PK	Pass	
761	4	7777.5000	36.98	7.97	29.01	74	-37.02	257.5	Vertical	PK	Pass	
	5	10641.0000	43.52	14.48	29.04	74	-30.48	360.1	Vertical	PK	Pass	
	6	12912.0000	44.1	16.16	27.94	74	-29.9	326.9	Vertical	PK	Pass	

Final Data List

												1. 1
	NO.	Freq. [MHz]	Reading [dB(uV)]	Factor [dB]	Level [dB (uV)]	Limit [dB]	Margin [dB]	Deg [°]	Polarity	Trace	Verdic t	
5	1	1584.3750	31.07	24.92	6.15	54	-22.93	101.4	Vertical	AV	Pass	
J	2	2769.3750	35.91	27.92	7.99	54	-18.09	267.4	Vertical	AV	Pass	1
	3	3960.0000	40.63	29.6	11.03	54	-13.37	188.6	Vertical	AV	Pass	
	4	7777.5000	29.53	7.97	21.56	54	-24.47	257.5	Vertical	AV	Pass	V
/	5	10641.0000	36.48	14.48	22	54	-17.52	360.1	Vertical	AV	Pass	
-	6	12912.0000	37.06	16.16	20.9	54	-16.94	326.9	Vertical	AV	Pass	

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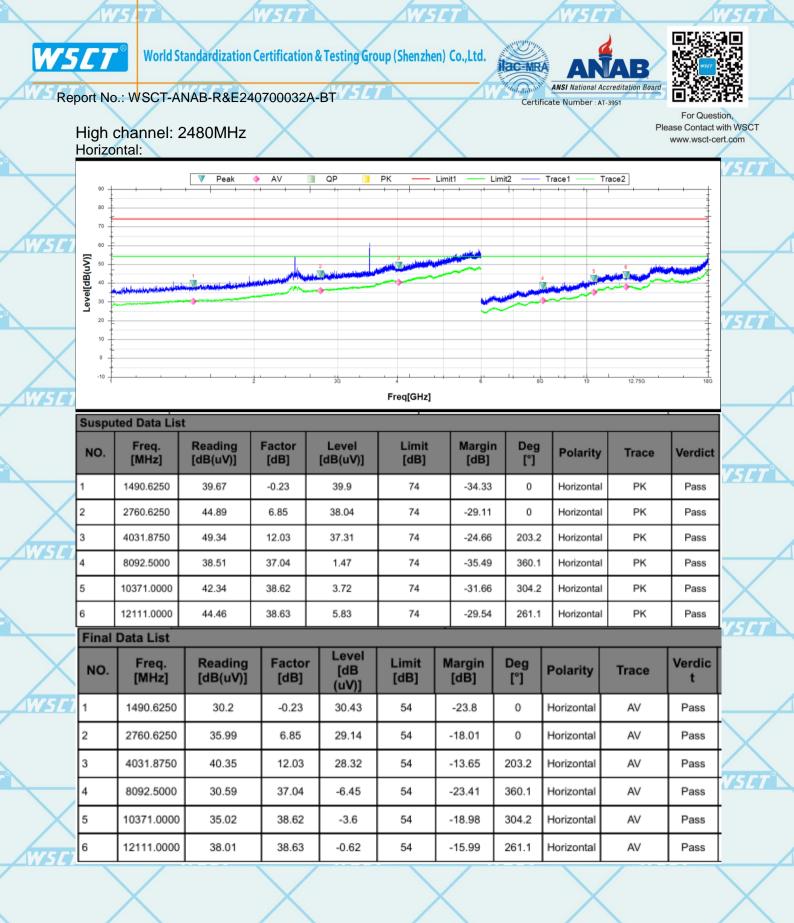
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(Shenz ADD:Building A-B, Baoli'an industrial Park, No. 58 Tangtou Avenue, Shiyan Street, Bao'an District Shenzhen, Guangdong china TEL: 86-755-26996192 226996053 Fax: 86-755-86376605 E-mail: Fengbing.Wang@wsct-cert.com Http: www.wsct-cert.com 世标检测认证股份

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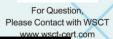


Vertical:

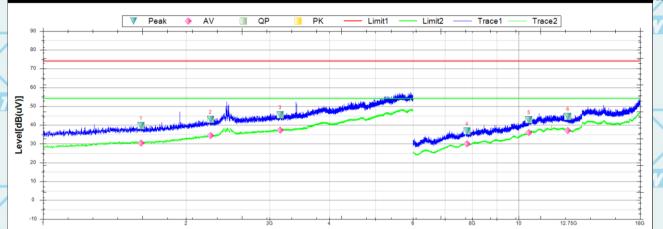
World Standardization Certification & Testing Group (Shenzhen) Co.,Ltd.

Certificate Number : AT-3951

Report No.: WSCT-ANAB-R&E240700032A-BT



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Freq[GHz]

	Suspu	ited Data Lis	st									
	NO.	Freq. [MHz]	Reading [dB(uV)]	Factor [dB]	Level [dB(uV)]	Limit [dB]	Margin [dB]	Deg [°]	Polarity	Trace	Verdict	
	1	1607.5000	39.61	0.14	39.47	74	-34.39	49.9	Vertical	PK	Pass	V
/	2	2250.6250	43.07	4.6	38.47	74	-30.93	0	Vertical	PK	Pass	
X	3	3153.7500	45.36	8.22	37.14	74	-28.64	52.3	Vertical	PK	Pass	
C	4	7794.0000	36.83	36.69	0.14	74	-37.17	359.9	Vertical	PK	Pass	
	5	10519.5000	42.72	38.83	3.89	74	-31.28	87.6	Vertical	PK	Pass	
	6	12702.0000	44.64	38.81	5.83	74	-29.36	80.4	Vertical	PK	Pass	
		D / 11/1										

Final	Data List									
NO.	Freq. [MHz]	Reading [dB(uV)]	Factor [dB]	Level [dB (uV)]	Limit [dB]	Margin [dB]	Deg [°]	Polarity	Trace	Verdic t
1	1607.5000	30.45	0.14	30.31	54	-23.55	49.9	Vertical	AV	Pass
2	2250.6250	34.38	4.6	29.78	54	-19.62	0	Vertical	AV	Pass
3	3153.7500	37.26	8.22	29.04	54	-16.74	52.3	Vertical	AV	Pass
4	7794.0000	30	36.69	-6.69	54	-24	359.9	Vertical	AV	Pass
5	10519.5000	35.9	38.83	-2.93	54	-18.1	87.6	Vertical	AV	Pass
6	12702.0000	37.17	38.81	-1.64	54	-16.83	80.4	Vertical	AV	Pass
	NO. 1 2 3 4 5	NO. [MHz] 1 1607.5000 2 2250.6250 3 3153.7500 4 7794.0000 5 10519.5000	NO. Freq. [MHz] Reading [dB(uV)] 1 1607.5000 30.45 2 2250.6250 34.38 3 3153.7500 37.26 4 7794.0000 30 5 10519.5000 35.9	NO. Freq. [MHz] Reading (dB(uV)] Factor [dB] 1 1607.5000 30.45 0.14 2 2250.6250 34.38 4.6 3 3153.7500 37.26 8.22 4 7794.0000 30 36.69 5 10519.5000 35.9 38.83	NO. Freq. [MHz] Reading [dB(uV)] Factor [dB] Level [dB (uV)] 1 1607.5000 30.45 0.14 30.31 2 2250.6250 34.38 4.6 29.78 3 3153.7500 37.26 8.22 29.04 4 7794.0000 30 36.69 -6.69 5 10519.5000 35.9 38.83 -2.93	NO. Freq. [MHz] Reading [dB(uV)] Factor [dB] Level [dB] (uV)] Limit [dB] 1 1607.5000 30.45 0.14 30.31 54 2 2250.6250 34.38 4.6 29.78 54 3 3153.7500 37.26 8.22 29.04 54 4 7794.0000 30 36.69 -6.69 54 5 10519.5000 35.9 38.83 -2.93 54 6 12702.0000 37.17 38.81 -1.64 54	NO.Freq. [MHz]Reading [dB(uV)]Factor [dB]Level [dB (uV)]Limit [dB]Margin [dB]11607.500030.450.1430.3154-23.5522250.625034.384.629.7854-19.6233153.750037.268.2229.0454-16.7447794.00003036.69-6.6954-24510519.500035.938.83-2.9354-18.1612702.000037.1738.81-1.6454-16.83	NO.Freq. [MHz]Reading [dB(uV)]Factor [dB]Level [dB]Limit [dB]Margin [dB]Deg [°]11607.500030.450.1430.3154-23.5549.922250.625034.384.629.7854-19.62033153.750037.268.2229.0454-16.7452.347794.00003036.69-6.6954-24359.9510519.500035.938.83-2.9354-18.187.6612702.000037.1738.81-1.6454-16.8380.4	NO. Freq. [MHz] Reading [dB(uV)] Factor [dB] Level [dB] (uV)] Limit [dB] Margin [dB] Deg [°] Polarity 1 1607.5000 30.45 0.14 30.31 54 -23.55 49.9 Vertical 2 2250.6250 34.38 4.6 29.78 54 -19.62 0 Vertical 3 3153.7500 37.26 8.22 29.04 54 -16.74 52.3 Vertical 4 7794.0000 30 36.69 -6.69 54 -24 359.9 Vertical 5 10519.5000 35.9 38.83 -2.93 54 -18.1 87.6 Vertical 6 12702.0000 37.17 38.81 -1.64 54 -16.83 80.4 Vertical	NO. Freq. [MHz] Reading [dB(uv)] Factor [dB] Level [dB] (uv)] Limit [dB] Margin [dB] Deg [°] Polarity Trace 1 1607.5000 30.45 0.14 30.31 54 -23.55 49.9 Vertical AV 2 2250.6250 34.38 4.6 29.78 54 -19.62 0 Vertical AV 3 3153.7500 37.26 8.22 29.04 54 -16.74 52.3 Vertical AV 4 7794.0000 30 36.69 -6.69 54 -24 359.9 Vertical AV 5 10519.5000 35.9 38.83 -2.93 54 -18.1 87.6 Vertical AV 6 12702.0000 37.17 38.81 -1.64 54 -16.83 80.4 Vertical AV

Note:

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1. The emission levels of other frequencies are very lower than the limit and not show in test report.

2. Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency.

 Data of measurement shown "---"in the above table mean that the reading of emissions is attenuated more than 20 dB below the limits or the field strength is too small to be measured.
 Measurements were conducted in all three modulation (GFSK, Pi/4 DQPSK, 8DPSK), and the worst case Mode (GFSK) was submitted only.

EUT has been tested in unfolded states, and the report only reflects data in the unfolded state (worst-case scenario)

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Report No.: WSCT-ANAB-R&E240700032A-BT

7. Test Setup Photographs

Please refer to Annex "Set Up Photos-15C" for test setup photos

For Question, Please Contact with WSCT www.wsct-cert.com

*****END OF REPORT*****

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